

Attachment A

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>
> /*****
> *
> * MODULE NAME:
> *   MDB_rte - Map Database point-to-point routing
> *
> * DESCRIPTION:
> *   Module contains routines for:
> *   1. Finding a route between two points
> *
> * PUBLIC PROCEDURES:
> *   Name           Title
> *   -----
> *   MDB_close_rte_nod_wor.. Close route node work area
> *   MDB_find_route      Calculates a route
> *   MDB_get_node_info    Fetches info about a node
> *   MDB_init_route_config Initializes a route config object
> *   MDB_open_rte_nod_work.. Initialize a route node work area from a
> map db
> *
> * PRIVATE PROCEDURES:
> *   Name           Title
> *   -----
> *   mdb_get_date_time_mods Fetches date/time mods for a restriction
> *   mdb_get_driving_restr.. Fetches a driving restriction
> *   mdb_get_node_adj_list  Fetches the adjacency list for a node
> *   mdb_get_restriction_o.. Fetches the restriction offsets for a node
> *
> * INLINE PROCEDURES:
> *   Name           Title
> *   -----
> *   alloc_chunk
> *
> * LOCAL PROCEDURES:
> *   Name           Title
> *   -----
> *   build_route
> *   create_heaps
> *   compact_route
> *   get_route_turn_angles
> *   init_avoid_list
> *   init_bearing_factors
> *   is_short_route
> *
> * Copyright 2000-2001 by GARMIN Corporation.
> * -----
> * $Log:
> * 56  PVCS GMapSWT1.55      8/4/2000 8:30:04 AM  Michael Childs
> * Tweaked some node traversal tuning parameters. Now crossing a
> road
> * with a higher routing level is twice as expensive. In
> addition,
> *
> * roads with a speed less than 30 mph are not considered for
> node

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> * traversal costs
 > * 55 PVCS GMapSWT1.54 7/14/2000 9:40:08 AM Michael Childs
 > Made
 > * node traversal cost calculation incorporate relative routing
 > levels
 > * in addition to relative speed categories.
 > * 54 PVCS GMapSWT1.53 7/10/2000 2:48:04 PM Michael Childs
 > Fixed
 > * route initialization bug.
 > * 53 PVCS GMapSWT1.52 6/30/2000 2:11:00 PM Michael Childs
 > *
 > * 52 PVCS GMapSWT1.51 6/30/2000 2:09:20 PM Michael Childs
 > *
 > * 51 PVCS GMapSWT1.50 6/30/2000 8:14:12 AM Michael Childs
 > *
 > * 50 PVCS GMapSWT1.49 6/27/2000 3:07:52 PM Michael Childs
 >
 > * 49 PVCS GMapSWT1.48 6/26/2000 3:55:28 PM Michael Childs
 > *
 > * 48 PVCS GMapSWT1.47 6/23/2000 10:31:24 AM Michael Childs
 >
 > * 47 PVCS GMapSWT1.46 6/22/2000 11:59:24 AM Michael Childs
 > Added
 > * MRU node block cache support.
 > * Optimized estimate_position by removing all divide operations.
 > * Optimized some macros to avoid divides (i.e. MT_TO_SEMI).
 > * Replaced hard-coded gate traversal cost with configuration
 > parameter.
 > *
 > * Made through-traffic restricted adjacencies incur an extra cost
 > so
 > * that
 > * routes will avoid them if possible.
 > * Added debug timing variables (temporary change).
 > * 46 PVCS GMapSWT1.45 6/21/2000 4:49:42 PM Steve Robinson -
 > *
 > * 45 PVCS GMapSWT1.44 6/21/2000 3:49:06 PM Steve Robinson -
 > *
 > * 44 PVCS GMapSWT1.43 6/15/2000 11:52:32 AM Michael Childs
 >
 > * 43 PVCS GMapSWT1.42 6/15/2000 10:21:00 AM Michael Childs
 >
 > * 42 PVCS GMapSWT1.41 6/14/2000 3:06:56 PM Michael Childs
 >
 > * 41 PVCS GMapSWT1.40 6/14/2000 2:50:10 PM Michael Childs
 > Made
 > * max solutions and max basemap jumps configurable parameters.
 > * Updated for new format in which the adjacency position can be
 > * estimated
 > * from information directly stored in the adjacency record thus
 > * avoiding
 > * a spill to the adjacent node's information.
 > * Fixed bug which caused node traversal cost to never be added in
 > * reverse dir.
 > * 40 PVCS GMapSWT1.39 6/6/2000 5:01:00 PM Michael Childs
 > * Included costs to travel from the starting position to the first

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> node
> *
> *      on the route when picking the best route.
> * 39 PVCS GMapSWT1.38      6/6/2000 3:35:16 PM  Michael Childs
> Fixed
> *      bug with calculating route cost for route with 1 forward dir
> node.
> *      Made solution finding check all nodes that match in the other
> search
> *      direction as possible solutions.
> * 38 PVCS GMapSWT1.37      5/31/2000 3:54:48 PM  Michael Childs
> *
> * 37 PVCS GMapSWT1.36      5/30/2000 3:53:34 PM  Michael Childs
>
> * 36 PVCS GMapSWT1.35      5/26/2000 10:02:42 AM  Michael Childs
>
> * 35 PVCS GMapSWT1.34      5/23/2000 5:09:34 PM  Michael Childs
> *
> * 34 PVCS GMapSWT1.33      5/23/2000 11:44:14 AM  Michael Childs
> *      Tweaked toll booth and gate costs.
> *      Made route travel time include restriction and node traversal
> time.
> * 33 PVCS GMapSWT1.32      5/23/2000 10:09:38 AM  Michael Childs
> *
> * 32 PVCS GMapSWT1.31      5/23/2000 9:58:14 AM  Michael Childs
> *      Replaced <avoid_tolls> flag with a toll cost factor.
> *      Changed toll road avoidance to be done per link rather than via
> toll
> *      booths.
> *      Added support for 8-bit bearings in adjacency records.
> *      Made highway and toll avoidance costs be taken into account when
> *      picking
> *      the best route out of multiple solutions.
> * 31 PVCS GMapSWT1.30      5/22/2000 2:03:36 PM  Michael Childs
>
> * 30 PVCS GMapSWT1.29      5/22/2000 1:28:04 PM  Michael Childs
> *      Changed distance to time calculation to use a scaled speed so as
> to
> *      avoid
> *      expensive divide operations.
> *      Modified node traversal cost to take into account the relative
> speed category of the cross street relative to the street we're on.
> * 29 PVCS GMapSWT1.28      5/19/2000 11:12:34 AM  Michael Childs
> Added
> *      node traversal cost calculation for simulating stop lights at
> major
> *      intersections.
> * 28 PVCS GMapSWT1.27      5/11/2000 11:12:46 AM  Michael Childs
>
> * 27 PVCS GMapSWT1.26      5/11/2000 11:03:16 AM  Michael Childs
> *
> * 26 PVCS GMapSWT1.25      5/9/2000 4:55:16 PM   Michael Childs
> *
> * 25 PVCS GMapSWT1.24      5/9/2000 9:08:46 AM   Michael Childs
> *
> * 24 PVCS GMapSWT1.23      5/8/2000 8:37:12 AM   Michael Childs

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> Made
> * restriction costs be included when picking best solution.
> * Made best route not have to be rebuilt if the first one found.
> * 23 PVCS GMapSWT1.22 5/5/2000 9:56:06 AM Steve Robinson -
> *
> * 22 PVCS GMapSWT1.21 4/28/2000 8:18:58 AM Michael Childs
>
> * 21 PVCS GMapSWT1.20 4/27/2000 11:38:08 PM Steve Robinson -
> *
> * 20 PVCS GMapSWT1.19 4/26/2000 10:03:06 AM Michael Childs
>
> * 19 PVCS GMapSWT1.18 4/25/2000 4:59:18 PM Michael Childs
>
> * 18 PVCS GMapSWT1.17 4/25/2000 9:32:38 AM Michael Childs
>
> * 17 PVCS GMapSWT1.16 4/20/2000 5:07:52 PM Michael Childs
>
> * 16 PVCS GMapSWT1.15 4/19/2000 3:48:28 PM Michael Childs
>
> * 15 PVCS GMapSWT1.14 4/19/2000 1:31:36 PM Michael Childs
> *
> * 14 PVCS GMapSWT1.13 4/14/2000 10:38:40 AM Michael Childs
>
> * 13 PVCS GMapSWT1.12 4/13/2000 4:35:24 PM Michael Childs
>
> * 12 PVCS GMapSWT1.11 4/12/2000 1:37:36 PM Michael Childs
>
> * 11 PVCS GMapSWT1.10 4/11/2000 10:40:42 AM Michael Childs
> * Tweaked speed categories and layer switching thresholds.
> * Removed mdb_rte_get_turn_angles function.
> * Made each route store the total length and estimated travel
> time.
> * Included turn costs when picking the best route.
> * Made each route turn store the turn angle and segment length.
> * 10 PVCS GMapSWT1.9 4/7/2000 2:40:16 PM Michael Childs
> * Tweaked speeds for speed categories and turn cost calculation.
> * Added implementation of <mdb_rte_get_turn_angle> function.
> * 9 PVCS GMapSWT1.8 4/6/2000 10:27:50 AM Michael Childs
> * Replaced MDB_work_area_type based routing with
> mdb_rte_nod_wa_type
> * routing
> * in order to save on file handles and memory needed to route.
> * Added support for avoiding highways when routing.
> * Made routing through toll booths and gates more expensive.
> * 8 PVCS GMapSWT1.7 4/4/2000 3:21:44 PM Michael Childs
>
> * 7 PVCS GMapSWT1.6 4/4/2000 2:10:22 PM Michael Childs
>
> * 6 PVCS GMapSWT1.5 4/4/2000 8:50:30 AM Michael Childs
> * Removed ramp checking and turn cost modification.
> * Tweaked free memory layer switching constraints to give routes a
> * little
> * more time at the collector level (level 1).
> * Tweaked turn cost calculation (again).
> * 5 PVCS GMapSWT1.4 4/3/2000 3:03:14 PM Michael Childs
> Made

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> *      closed lists table and link cache a dynamically sized portion of
> the
> *      routing memory block rather than a static chunk determined
> at
> *      compile
> *      time.
> *      Tweaked turn cost calculation (now includes ramp information if
> *      available).
> * 4  PVCS GMapSWT1.3      3/31/2000 12:47:12 PM  Michael Childs
>
> * 3  PVCS GMapSWT1.2      3/27/2000 7:26:58 AM   Michael Childs
>
> * 2  PVCS GMapSWT1.1      3/24/2000 7:57:02 AM   Michael Childs
>
> * 1  PVCS GMapSWT1.0      3/23/2000 2:01:20 PM   Michael Childs
> * $
> * $NoKeywords$
> *
> *****/

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